UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE RO

REPLY TO: 3420 DATE: FEB 05 1987

SUBJECT: Dieback of Ceanothus crassifolius (Report No. 87-2)

TO: Forest Supervisor, Angeles NF
Dr. Phillip Riggan, PSW, Riverside

This memo summarizes Forest Pest Management's involvement, to date, with the dieback of Ceanothus crassifolius (hoaryleaf ceanothus) on the Angeles National Forest. Most of the information has been passed on to Forest, District or PSW personnel in one form or another since the spring of 1985.

In May of 1985, personnel from the Angeles National Forest reported to Forest Pest Management (FPM) that a dieback of brush was occurring across much of their low elevation, south-facing slopes that border the Los Angeles Basin. Ceanothus crassifolius appeared to be the only species involved at that time. A primary concern was the fire hazard that would be created if large acreages of brush were to die.

Above-ground parts of healthy, dying, and dead plants were sent by the Forest to the FPM office in San Francisco for examination. These samples were collected from the western-most part of the Tujunga Ranger District, north of San Fernando (see enclosed map). Visual examination of these samples did not reveal any obvious or commonly encountered pests that would explain the amount of damage. A few aphids and lacewings were present on some specimens, but they were not judged to play any significant part in the dieback. Leaves and sections of twigs were surface sterilized and incubated in either a moist chamber or on culture media. One fungus (scientific name not know at that time) was recovered from several dying twigs, but not from any healthy twigs.

In April, 1986, impacted areas on the San Dimas Experimental Forest were visited by Phil Riggan, Paula Jacks, Susanne Good (PSW), and John Pronos (FPM). Recently killed and dying Ceanothus were easily detected because of the yellow to tan colored foliage that contrasted with the green appearance of heathly chaparral. Dieback was not as prevalent as it had been a year earlier; however, by now, plants of all ages were dead over large acreages.

Our observations indicated that that dieback began with randomly distributed twigs and branches dying from the tip back to the main stem and could continue until the entire plant was dead. The leaves on affected twigs curled downward and eventually fell off. In many cases the cambium died gradually with no clear margin between healthy and dead tissue. In other instances a distinct strip of dead cambium and wood extended longitudinally along stems.

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The Angeles National Forest provided a fire crew for one day to help examine Ceanothus root systems. Three plants, each about 8 feet high and 8 feet wide, were completely excavated. One of the plants had no visible dieback, one had 60% live crown, and the third had only 20% live crown. It was common to find dead vascular and cambial tissue that began in the upper twigs and extended down the branch, trunk, and even into the roots. In general, roots systems showed the same proportion and distribution of dead material as was evident in the above-ground portions of each plant. These limited examinations did not provide enough information to conclude whether mortality began in the roots or above ground.

Specimens from the excavated plants, including roots, were collected and taken back to San Francisco for laboratory diagnosis. Plant materials were also collected from Arctostaphylos glauca and A. glandulosa (bigberry and eastwood manzanita) that were just beginning to show symptoms of dieback.

Although many fungi were recovered from samples incubated on culture media, a fungus identical in appearance to the one isolated previously from May, 1985 samples was repeatedly present. It was identified as Botryosphaeria ribis (= B. dothidea) and confirmed by the California Department of Food and Agriculture. This organism was recovered from unhealthy twigs of Ceanothus and both species of manzanita. It was not isolated from any leaves, healthy twigs, or root material.

Botryosphaeria ribis is a pathogen that causes dieback and cankers on many woody plants including avocado, elm, apple, peach, currant, lemon, pine, rhodendron, sweetgum, linden, willow, oak, eucalyptus, redwood, giant sequoia, Douglas-fir, madrone, and birch. The taxonomy of this fungus is unclear. The genus Botryosphaeria represents a sexual (perfect) stage that is readily identified but, unfortunately, not frequently found. Most identifications are made using more commonly occurring asexual (imperfect) stages, and this is where the taxonomic confusion arises. Differences in distinguishing characteristics that separate related genera of asexual fungi are slight and are influenced by environmental factors such as temperature, light, and host material. For these reasons asexual forms of Botryosphaeria have been placed in many genera, including:

1. Dothiorella
2. Macrophoma
3. Diplodia
4. Botryodiplodia
5. Sphaeropsis
6. Lasiodiplodia
7. Fusicoccum
8. Physalospora

What role is this fungus playing in the dieback of Ceanothus? Our answer is based on published literature, on experiences with other diebacks, and on our very limited field observations. Because this pathogen can infect such a large variety of woody plants, we doubt that spore inoculum required for infection would ever be a limiting factor. B. ribis is believed to require wounds in order to enter host tissue, unless the host is under considerable stress. Factors demonstrated to be capable of causing sufficient stress include drought, fire, transplanting, freezing temperatures, and defoliation.

Precipitation records were checked for several stations within the area affected by dieback. (La Cresenta, Mt. Wilson, Pacuima Reservoir, Pasadena, and San

Gabriel Fire Dept.) Rainfall for all of 1984 and for January through April of 1985 were roughly at about 50% of normal. This indicates that drought stress was certainly present prior to the first expression of disease symptoms, and continued during the period of most rapid dieback.

This area is also exposed to significant doses of a variety of air pollutants during much of the year. Los Angeles County commonly exceeds the primary State standards for oxidant, nitrogen dioxide, and particulate matter - 10 micron (based on monitoring results published by the California Air Resources Board).

Perhaps the appropriate combination and intensity of these three factors, which included moisture stress, air pollutants, and pathogen populations occurred for the first time in 1984 and 1985 to initiate the dieback. If these are the primary underlying causes, we would expect that a significant change in any one of them would subsequently affect the amount and duration of dieback.

This explanation, although speculative, is based on the known biology of the identified pathogen and a knowledge of environmental condition's that existed prior to and during the dieback. It would be extremely difficult to prove beyond any doubt that this combination of factors is wholly responsible for all brush mortality. Certainly there are other contributing factors that we are unaware of.

JOHN NEISESS
FPM Group Leader
State and Private Forestry

Enclosures

Selected References

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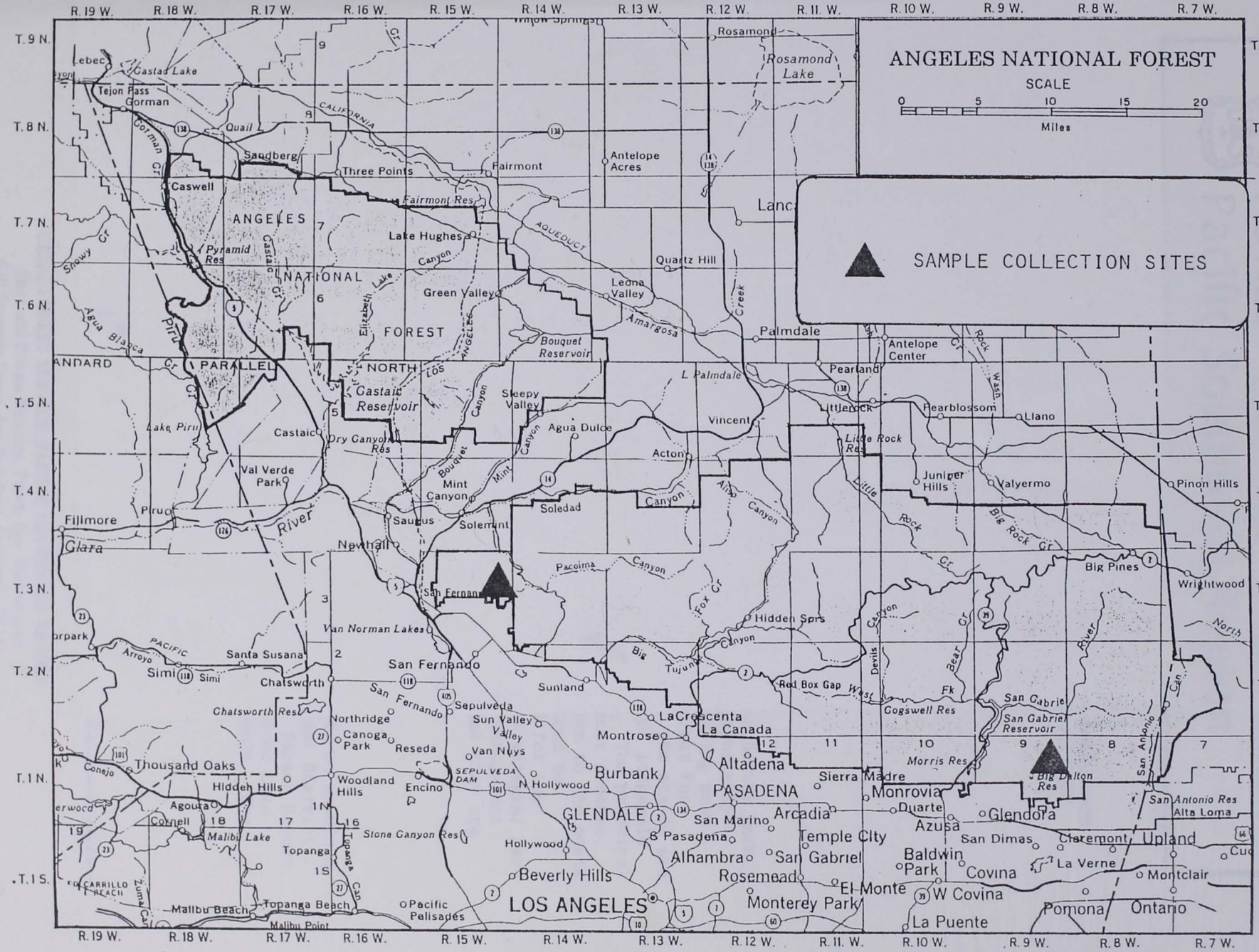
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Pyramid Res
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Bouquet Reservoir
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